

LOCAL AND REGIONAL SOURCES OF UFP IN URBAN STREETS

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Background and Aims: Ultrafine particle (UFP) numbers show large short-term and small scale variation, making strategies to assess personal exposure to UFP in urban environment potentially very costly. Better insight in the role of local and regional processes, can give rise to methods to estimate UFP using correlated pollutants and regional indicators (Can et al 2011).

Methods: UFP and NO_x were measured simultaneously in Antwerp (Belgium) at three locations in a single street in Summer 2009, and in four different streets in a 1 km grid in Winter 2010. Different size fractions were compared to traffic counts and meteorological data. Regional contributions to various size fractions were assessed using night time number concentrations and air mass back-trajectory techniques.

Results: In-street spatial variability of total particle number was rather low. UFP concentrations in four different streets showed a remarkably similar temporal trend on top of which the local component is added.

Total particle number correlated poorly with traffic intensity. Mainly the 20 – 50 nm fractions are correlated with traffic intensity.

The morning traffic peak leads to a distinct peak in total particle number, but this is not the case for the afternoon rush hour.

Analysis of diurnal UFP concentrations for different size bins shows that both processes of agglomeration and condensation and meteorological conditions explain this decoupling of traffic and total particle number. Elevated total night-time UFP was mainly related to larger size fractions (50 - 100 nm). Higher concentrations of the larger size bins were associated with slow moving air masses.

Conclusions: Although short-term variation in UFP number counts at urban traffic locations largely depends on local sources, similar temporal trends result both from regional processes and similar underlying traffic patterns. This study illustrates the potential to extrapolate measured UFP concentrations to similar locations using correlated pollutants and regional indicators.

References:

Can A, Rademaker M, Van Renterghem T, Mishra V, Van Poppel M, Touhafi A, Theunis J, De Baets B, and Botteldooren D. Correlation analysis of noise and ultrafine particle counts in a street canyon. *Sci.Tot.Env.* 2011;409:564-572.